CORRELATION BETWEEN MAXILLARY CENTRAL INCISOR TO FACIAL FORM, NAIL FORM AND LENGTH OF THE LOWER FACIAL HEIGHT TO LENGTH OF FINGERS: AN AUTO – CAD STUDY

Dental Science

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ABSTRACT

AIM: A study was performed to examine the correlation between maxillary central incisor tooth form to face form and finger nail forms of both males and females, in an south Indian population. Method: Two hundred dental students of Indian origin comprising 100 males and 100 females studying at GITAM Dental College were randomly selected as the study subjects. A standardized photographic procedure was used to obtain images of the face, maxillary central incisors and finger nails. Their Outline forms were determined using an AUTO CAD software and are used to correlate the similarity between them using visual method. The means were considered after the evaluation by 4 prosthodontists and results were tabulated. Results and Conclusion: Statistical analysis was performed using the chi-squared test for association. A correlation greater than 50% was observed between tooth form and face form by the visual method. Similarly the correlation between finger nail forms and tooth forms is less than 50% shows no significant results. In correlation between length of lower 1/3rd of the face with length of the five fingers, among females a significant correlation is established with ring and little fingers, with a close significance towards little finger.

KEYWORDS:

Tooth form, Face form, Nail form, Length of the fingers, Length of the lower facial height

INTRODUCTION:

Esthetics is the primary consideration for patients seeking prosthetic treatment so according to Young "it is apparent that beauty, harmony, naturalness, and individuality are major qualities" of esthetics.1, [2]

The term esthetics is derived from the Greek word aisthetikos, meaning perceptive 3 Esthetics, as applied to a complete denture prosthesis, may be defined as a combination of science and art. Art is in itself a science –that is the appreciation of the beautiful in both form and colour. By skillful application of this science, it is possible to produce beautiful restorations that are almost completely natural in appearance [4]

An attractive smile increases an individual's acceptability to society and improves interpersonal relationships. This tooth relationship can be affected by several factors such as shape, size, color, texture, symmetry, and proportion. Knowledge of these details can satisfy the needs of every patient. Beauty is not absolute but rather extremely subjective and perception is determined by the senses, knowledge, ethnic background, and preferences of each individual [5-7]

If some natural teeth remain in mouth, the procedure is straight forward to select artificial teeth that blend with natural dentition. But the choice of tooth mold, colour and arrangement becomes far more difficult for the patients with no preextraction records available. So the dentist must rely on his/her own clinical judgement, along with the patient's aesthetic preferences for tooth selection.

So in order to meet the aesthetic demands of the patients, numerous methods have been devised for determining artificial tooth form. The temperamental theory was the first one adopted in dentistry, which classified patients in four categories upon their temperament and therefore aesthetics. Dentogenics is a theory derived from observation based on personality, age and sex and relies on the sole discretion of the dentist[8]

Also, measuring devices such as the Trubyte Tooth Indicator, Trubite Teleform gauge, and Tooth selector have been used for determining the form of an artificial tooth [4,9-11]

But to date, Leon Williams observed that the outline of the face, when inverted, may correspond to the maxillary central incisor, resulting in desirable aesthetic which is called geometric theory, is still the most common theory for the choice of artificial teeth.[12]

In the present study, our hypothesis is to clinically examine the correlation between maxillary central incisor tooth form to face form and nail form in males and females in an Indian population. It was anticipated that any correlation obtained would be helpful for selection of artificial teeth for both male and female edentulous patients of Indian ethnicity. Similarly the correlation between length

of the lower 1/3rd of the face when teeth in centric occlusion and length of the fingers would be helpful to know the vertical dimension at occlusion.

MATERIALS AND METHODS

As study subjects, a total of 100 dental students (75 females and 25 males) of Indian origin belonging to different states and different age groups, who are students at GITAM dental college and hospital, visakhapatam, AP were randomly selected. The inclusion criteria were subjects of dentulous and aged 18-25 years, completely dentate arch with presence or absence of third molars and natural maxillary anterior teeth in good alignment. Exclusion criteria include subjects with restoration of maxillary anterior teeth by a complete or partial veneer crown / composite restorations, extensive carious lesions, incisal wear, tooth fracture and gingival hyperplasia, previous orthodontic treatment or orthognathic surgery, congenital or surgical facial defects and any anomalies of the teeth. Oral prophylaxis and polishing was performed 6 days before the study.

PROCEDURE

Each subject was seated upright with the head supported by a head rest on a chair with the occlusal plane of the maxillary teeth parallel to the floor. Three standardized photographs were taken for each subject:

Facial portrait (closed lips) [Fig 1a]
Maxillary incisors [Fig 1b]
Right hand finger nail forms [Fig 1c]
For each photograph, standardized distances (portrait 100 cm, teeth 12 cm and nail 12cm) were
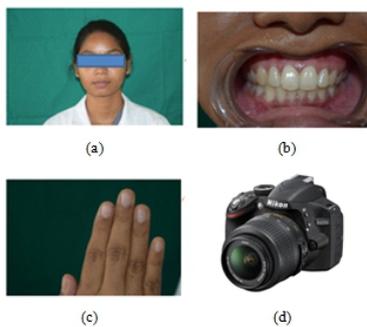

Fig 1 : (a) Facial portrait (closed lips); (b) Maxillary central incisors; (c) Right hand finger nail forms; (d) NIKON D3200 (DSLR)

The height of the NIKON D3200 (DSLR) [Fig 1d] camera with 14.2 MP, DX Format, lens of 18-55mm, CMOS image, ISO- 400 and a shutter speed of 1/4000 seconds mounted on a tripod was adjusted individually according to the position of the subject's face, teeth and nails.

Now the images of the teeth, face and nails were then transferred to a running image editing software. (AUTO CAD) Using AUTO CAD software, the facial outline form (face form) was determined from the outline of the temporal bone at the height of the hairline, the temporal process of the zygomatic arch, and the gonion and a line is drawn at the level of eye brows parallel to the occlusal plane upon the line drawn following the curvature of the face inferiorly. The right maxillary central incisor tooth outline form (tooth form) was determined using an outline tracing made around the buccal surface of the tooth, which corresponded to the mesial and distal contours, the incisal edge, and the cervical margin .similarly index, middle, ring and little fingers nail form outlines of right hand were drawn using CAD software.

The photographic print-outs [Fig 2] containing individual subject photographs with tracings of facial form, tooth form and nail forms were taken separately. Nail form of thumb was eliminated in the study. A blind study was conducted for photographic evaluation

using the outline tracing prints for correlating face form, tooth form and nail by the visual method. This was performed by four prosthodontists each having minimum of 8 years of exper
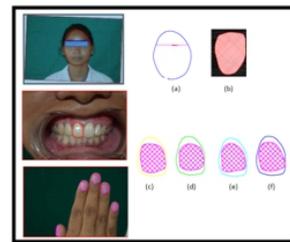

Fig 2: AUTO CAD outline tracings of (a) facial form (b) maxillary right central incisor (c) (d) (e) (f) nail form tracings of index, middle, ring and little fingers.

VISUAL METHOD

Depending upon the percentage of matching of overlapped outline forms, classified into three groups

I.   Corresponds - >80%
II.   Similar – 60 – 80 %
III.   Dissimilar - < 60 %

Each of the prosthodontists were given a set of copies, of 100 subjects, consisting of overlapped face and tooth form outlines, tooth and nail form outlines to evaluate using visual method.

After evaluation, percentage of matching for a particular subjects tooth and face form, tooth and nail forms given by the four evaluators were tabulated.

For example:
Face and tooth form

S.NO	Subject	Evaluator 1	Evaluator 2	Evaluator 3	Evaluator 4
1.	Subject 1	C	C	C	C
2.	Subject 2	S	S	C	C
3.	Subject 3	S	S	S	S

Establishing the correct vertical dimension of the edentulous mouth is one major concern in treating edentulous patients. In addition to functional importance, the lower third of the face affects one's facial expressions and appearance. So, the restoration of a pleasing appearance is one of the primary goals of aesthetic dentures. Vertical dimension is expressed in terms of occlusal vertical dimension (OVD) and vertical dimension at rest (VDR). In clinical practice, a fully precise method of determining the exact vertical relation of occlusion does not exist. The correct measurement of the natural OVD is the most essential criterion while fabricating successful complete dentures.

Glossary of Prosthodontic Terms defines the OVD as the distance between two selected points when the occluding members are in contact, and the rest vertical dimension as the distance between two selected points when the mandible is in the physiologic rest position

Different authors and their methods include Goodfriend 13measured the distance between pupil of eye and rima oris equaled the distance from subnasion to gnathion. McGee14 suggested the distance from the center of the pupil of the eye to a line projected laterally from the median line of the lips, the distance from the glabella to the subnasion and the distance between the angles of the mouth with the lips in repose.Silverman15 record closest speaking space of all patients after they are 20 years of age for use later in their lives. Swenson16 constructed a clear resin mask of the lower part of the face, Turner17 "Cut-out method" using a simple pantograph and Tueller 18 Electronic method.

In this context of study, for 100 subjects the length of the lower facial height when teeth are in centric occlusion and length of the five fingers were measured To measure the OVD, The subject was seated comfortably in the dental chair in a fully upright position, with the back of the subject in maximal contact with the back of the chair. A head rest was used to support the head with the ala-tragus line of the subject in a horizontal position, which was maintained throughout the measurements. Subject was made to occlude the teeth in maximum intercusption.. The distance was measured with the digital vernier callipers with its flat end resting on the base of the nose while the other, longer end projected at the base of the chin [Fig 3a]

A digital vernier calliper was used to measure the length of the fingers, as in the method used by Kumar et al.19 The proximal point on the radial side of the proximal crease over the first metacarpophalangeal joint and the distal point in the dactylion, the distal most part of the fingers, were marked. The ends of the caliper were placed over these two landmarks, and the distance between them gave the maximum length of the fingers [Fig 3b]

The readings were tabulated

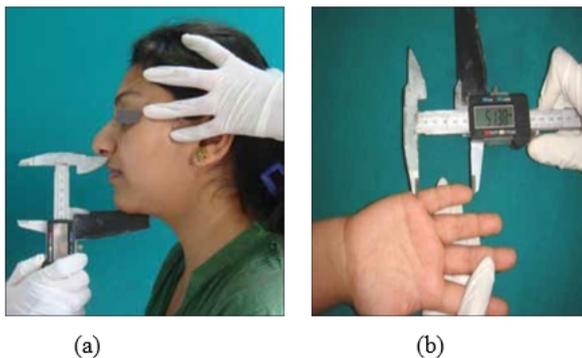| Subjects	Thumb	Index	Middle	Ring	Little	Lower 1/3rd length of face
1	55.42	60.93	71.46	62.42	50.72	52.83
2	66.44	70.95	76.86	74.97	61.69	54.60
3	55.17	65.27	69.47	63.14	55.23	52.21

Fig 3: Using digital vernier calliper measuring (a) length of lower 1/3rd of face (b) length of fingers.

The mean values were taken, and the respective percentages were calculated by statistical analysis using the chi-squared test for association and the Z-test for equality of proportions.

STATISTICAL ANALYSIS
Females (TABLE 1)

%	CORRESPONDS	SIMILAR	DISSIMILAR
Face vs tooth form	18.75	58.55	22.70
Thumb nail vs tooth	2.63	12.83	84.54
Index nail vs tooth	8.88	46.05	45.07
Middle nail vs tooth	16.78	46.38	36.84
Ring nail vs tooth	33.88	42.76	23.36
Little nail vs tooth	13.16	40.79	46.05

GRAPH 1
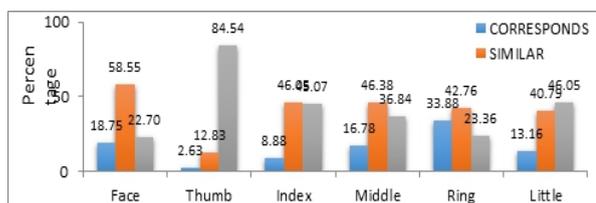
TABLE 2 (Males)

%	CORRESPONDS	SIMILAR	DISSIMILAR
Face vs tooth form	23	49	28
Thumb nail vs tooth	4	9	87
Index nail vs tooth	6	42	52
Middle nail vs tooth	6	40	54
Ring nail vs tooth	24	40	36
Little nail vs tooth	9	46	45

GRAPH 2
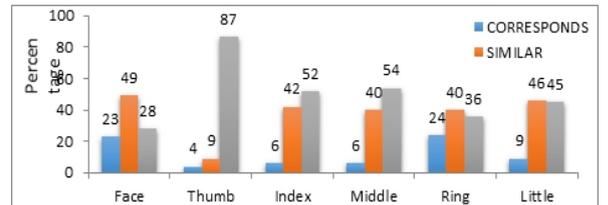
TABLE 3 [Females]

Lower 1/3rd length of face Vs Fingers	r-value	P-Value	Decision
Thumb finger length	0.146	0.213	Not Significant
Index finger length	0.119	0.311	Not Significant
Middle finger length	0.215	0.066	Not Significant
Ring finger length	0.245	0.035	Significant
Little finger length	0.307	0.008	Significant

GRAPH 3 [Females]
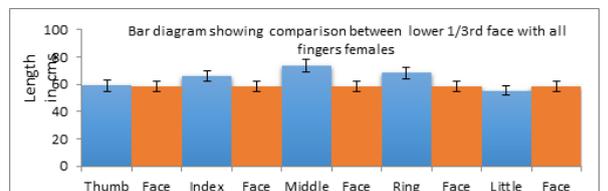
TABLE 4 [Males]

Lower 1/3rd length of face Vs Fingers	r-value	P-Value	Decision
Thumb finger length	0.128	0.534	Not Significant
Index finger length	0.102	0.621	Not Significant
Middle finger length	0.094	0.648	Not Significant
Ring finger length	0.016	0.938	Not Significant
Little finger length	-0.064	0.754	Not Significant

GRAPH 4 [Males]
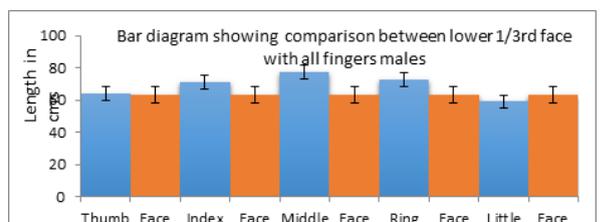
RESULTS
The outline form of maxillary right central incisor was correlated with the outline forms of facial form and right hand finger nail forms and also compared the correlation between length of the lower 1/3rd facial height with the length of the right hand fingers. Statistical

analysis was performed using the chi-squared test for association Table 1, 2 depicts 58.55% and 49 % of similarity between tooth and face forms among females and males found to be non significant with a p value of > 0.005.similarly tooth and nail forms among them shows a correlation of 46.8% and 46% with middle and little finger respectively, with the p values of 0 and 0.0018 showing non significant among females and significant with males.

Tables 3, 4 shows a significant p value of 0.008 with the length of the little finger in females when correlating with the lower 1/3rd of the face and a p value of > 0.005 among males showing non significant results.

DISCUSSION

The purpose of this paper was to identify the central incisor shape with face, nail forms and to investigate the possible resemblance between them. The principle of resemblance states: "two things are equal when they have everything in common; they are different when they have nothing to partake and similar when the common elements prevail over the differences 20

"Good shapes" are those that adapt to the laws of symmetry, continuity, proximity, simplicity, homogeneity, closure, and compactness. They tend to substitute for "bad shapes", influencing esthetic preferences. Visual information is subject to the influence of the mind, which is not instinctively logical, so a blind study was conducted 21-22

In a study, conducted by Pavankumar R. Koralakunte and Dhanyakumar H. Budihal 4 for the correlation between maxillary central incisor tooth form and face form by visual method, have quoted descriptive statistics for males and females .out of 200 subjects, the percentage of correlation given for 100 males and 100 females were 53% and 48% respectively.

In the present study, correlation of 58.55% between tooth form and face form in females was higher in studying showing a 48% correlation and is also greater than the correlation given by Williams in his study was 50%.The correlation between maxillary central incisor form and finger nail forms among females, middle finger shows highest percentage of 46.38% than other nail forms. Cigrande in 1913 used the outline form of the fingernail to select the outline form of the upper central incisor tooth. The size was modified to meet the requirements of tooth space and other relationship. A significant correlation was established with ring and little fingers when correlating with length of the lower 1/3rd of the face, with close association with little finger (p value 0.008).

In the present study, correlation of 49% between tooth form and face form in males was less than in a studying showing a 53% correlation and is also lesser than the correlation given by Williams in his study was 50%.The correlation between maxillary central incisor form and finger nail forms among males, little finger nail shows highest percentage of 46% than other nail forms In correlation between length of lower 1/3rd of the face with length of the five fingers, among males a significant correlation was not established with any of the five fingers with the p value > 0.005.

In the papers of Peixoto et al.,23 Ibrahimagi et al.,24 Pavankumar et al.,4 the relationship between the shape of the right central incisor and the shape of the face using a photographic method was 41.7%, 30% and 31.5% respectively. The studies of Ibrahimagi et al. and Pavankumar et al.4 did not agree with "The law of harmony" either.

Mavroskoufis et al. and Varjão et al 25 likewise conducted a study using the photographic method. They compared the relationship between the shape of the face and shape of the upper right central incisor and did not get an agreement with "The law of harmony" either.26They even obtained lower relationship values with 17.2% and 23.7% respectively. Both, in the present study and in the studies conducted by other researchers, different percentages regarding the

relationship between the shape of incisor and the shape of the face were obtained. These variations may be due to differences among the groups studied. As this study is different from the other studies, where the outline tracings of face, tooth and nail forms are obtained using AUTO CAD software which is more precise.

CONCLUSION

Within the limitations of the present study, it was concluded that there is no highly defined correlation between maxillary central incisor tooth form to face form as well as tooth form to finger nail forms in males and females of Indian ethnicity. But the face form and nail forms acts like a guide in selection of anterior restoration.

Instead, the opinions and desires of the patient should be considered, to ensure optimal dental esthetics for each individual. Similarly length of the fingers (little finger in females) shows significant results to length of lower 1/3rd of face, but it should not take this method as a sole entity to measure the lower length of face at occlusion, instead the other methods should also take into consideration while measuring it.

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